

CASE REPORT

Infectious endocarditis due to *Streptococcus pneumoniae* in a cardiac surgery patient: a new form of clinical presentation

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Background

Pneumococcal endocarditis (PE) has become uncommon since the advent of penicillin; it now develops in less than 1% of native heart valves [1]. However, an increase in the number of prosthetic heart valves as a predisposing factor for PE has recently been observed, accounting for 22–31% of all cases of valve endocarditis [2]. Furthermore, many cases of penicillin-resistant *Streptococcus pneumoniae* (SP) have been reported in recent years [3], and high morbidity and mortality rates are associated with endocarditis caused by this microorganism [1, 4]. This highlights the importance of early diagnosis and appropriate treatment. In the present report, we describe a case involving a 68-year-old Caucasian male with a prosthetic aortic valve and permanent pacemaker. He was admitted for PE, and transesophageal echocardiography (TEE) showed an aortic periannular abscess with paravalvular dehiscence, severe aortic paravalvular regurgitation, and a vegetation. One side of the vegetation was attached to the tricuspid valve septal leaflet, and the other was in contact with a pacemaker electrode. Despite early diagnosis and

Key Clinical Message

High mortality associated with pneumococcal endocarditis is due to late diagnosis and the frequency of complications, which usually require early diagnostic and intensive therapeutic measures. We present the first reported case of pneumococcal endocarditis with simultaneous infection of an aortic prosthetic valve, native tricuspid valve, and permanent pacemaker lead.

Keywords

Aortic prosthetic valve dysfunction, infective endocarditis, pacemaker lead infection, *Streptococcus pneumoniae*.

appropriate medical treatment, the patient died shortly before undergoing emergency surgery.

Case Report

A 68-year-old Caucasian male was admitted because of a 48-hour history of fever, a worsening general condition, and mild drowsiness. His medical history included hypertension treated with Ramipril 2.5 mg/day and type II diabetes mellitus treated with oral antidiabetics. Six years earlier, he had undergone aortic valve replacement with a St. Jude Medical No. 23 mechanical valve, and since then had been taking coumadin; two years before that, he had undergone implantation of a permanent endocavitary pacemaker. Physical examination on admission showed an axillary temperature of 38.5°C, rhythmic mechanical heart sounds, an early diastolic murmur in the aortic area, and a II/VI systolic murmur in the tricuspid area; the rest of the examination findings were unremarkable.

Laboratory tests showed the following results: hemoglobin, 11.6 g/dL (Normal range (NR): 13.5–17.5 g/dL); leukocyte count, 12,200/μL (NR: 4500–11,100/μL) with

neutrophil predominance (81.2%) (NR: 50–66%); C-reactive protein, >90 mg/L (NR: 0–12 mg/L); fibrinogen, 593 mg/dL (NR: 220–450 mg/dL); creatinine, 1.4 mg/dL (NR: 0.1–1.1 mg/dL); aspartate aminotransferase, 100 U/L (NR: 0–40 U/L); alanine aminotransferase, 188 U/L (NR: 0–40 U/L); lactate dehydrogenase, 700 U/L (NR: 135–235 U/L); international normalized ratio (INR), 7.4 (NR: 0.8–1.1); and N-terminal pro-brain natriuretic peptide, 4610 pg/mL (NR: <300 pg/mL). The results of urinalysis and sediment were normal. Transthoracic echocardiography (TTE) performed within 24 h of admission showed prosthetic valve dysfunction and severe paravalvular leakage, but no etiological data. At 48 h after admission, TEE revealed a periannular abscess on the prosthetic aortic valve (Fig. 1, arrow; see Movie S1) with severe aortic paravalvular regurgitation (Fig. 2, arrow; see Movie S2) and a mobile vegetation attached to both the tricuspid

septal leaflet and the pacemaker lead (Fig. 3, arrow; see Movie S3).

Chest radiographs showed no pulmonary consolidation suggestive of pneumonia. Brain computed tomography findings were unremarkable. No lumbar puncture was performed because the patient had a high INR due to coumadin and a high risk of bleeding. He was treated on the recommendation of the infectious diseases department at our center, with intravenous ampicillin, daptomycin, and gentamicin before the results of blood culture and the antibiogram were available. Penicillin-sensitive SP was isolated on blood cultures (4/4), the ampicillin was replaced by ceftriaxone and daptomycin was discontinued. This antibiotic regime was applied given the extreme clinical severity of the patient, considered to have late community-acquired infectious endocarditis (≥ 12 months after surgery).

On day 5 after admission, before emergency cardiac surgery could be performed, the patient developed cardiogenic shock with cardiac arrest and died.

Discussion

The precise incidence of PE after the use of penicillin is unknown, but some studies have reported rates of around 3% [1, 5]. PE has been reported in less than 1% of native heart valves and in 22–31% of valvular prostheses, most frequently prosthetic aortic valves; however, two or more valves are simultaneously involved in up to 13% of cases [1]. Pacemaker lead infection by SP occurs in less than 4% of cases [6]. What makes our case unusual and

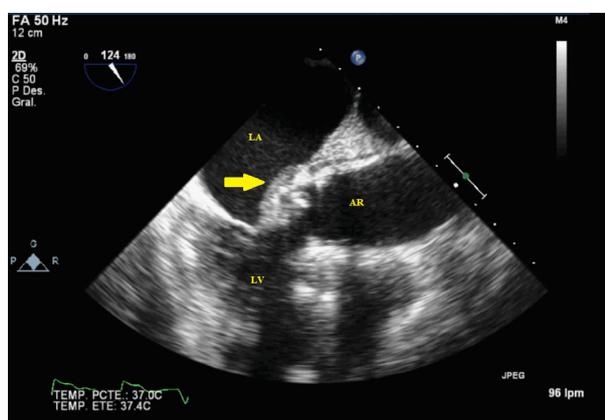


Figure 1. Transesophageal echocardiography: periannular abscess (arrow) on the prosthetic aortic valve. LA, left atrium. AR, aortic root. LV, left ventricle.

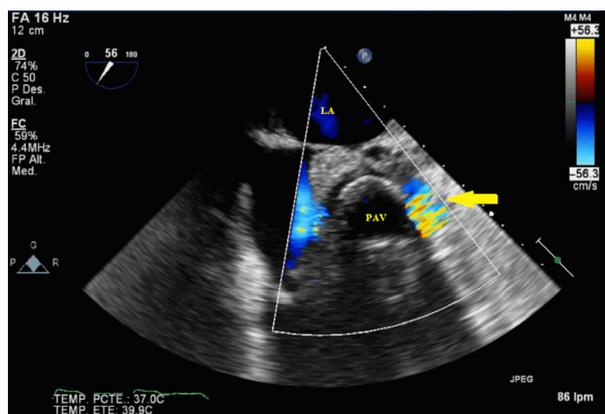


Figure 2. Transesophageal echocardiography: paravalvular dehiscence with severe paravalvular regurgitation (arrow). LA, left atrium. PAV, prosthetic aortic valve.

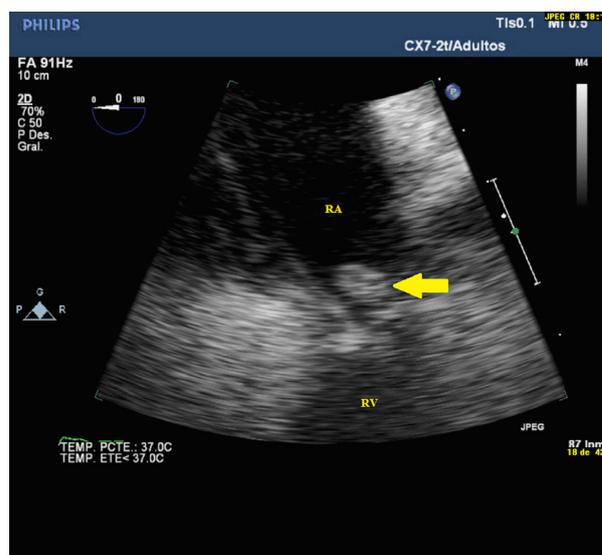


Figure 3. Transesophageal echocardiography: a vegetation (arrow) attached to the tricuspid valve and the pacemaker lead. RA, right atrium. RV, right ventricle.

unexpected is the simultaneous infection of an aortic prosthetic valve, native tricuspid valve, and permanent pacemaker lead.

The most common risk factor for PE is alcoholism, followed by advanced age, malnutrition, immunosuppression, and previous valve disease [7]. In our patient, the only risk factor present was previous valve disease.

Although cases of PE are rare, mortality remains high, ranging from 28–60% [8]. The clinical presentation is usually acute, with a rapid and aggressive clinical course. Complications are frequent and include congestive heart failure in 48.6% of cases, valve perforation in 34.7%, paravalvular abscesses in 33.7%, and embolization in 24.3% [1]. Both paravalvular abscess (Fig. 1) and paravalvular dehiscence (Fig. 2) were present in our case.

In a literature review of patients with PE, Aronin et al. [1] reported that: (a) two or more valves were involved in 16 cases (13%); and (b) 12 of 37 patients (32%) managed with combined medical–surgical treatment died, compared to 56 of the 91 patients (62%) treated only with antibiotics. Two of the latter patients had penicillin-resistant SP, and responded favorably to medical treatment. One was a 2-year-old child who received sequential parenteral antibiotic therapy with imipenem, cefuzonam, and ampicillin for 11 weeks. The other was a 63-year-old woman with PE of a native aortic valve, successfully treated with a 6-week course of vancomycin and rifampin.

Another review of 16 patients with PE [9] reported that the aortic and mitral valves were simultaneously affected in 4 cases (25%); these patients evolved satisfactorily, with medical treatment in two cases and combined medical–surgical treatment in the other two. Surgery was performed in 5 cases (31%) and 13 (81%) of the whole sample survived.

Echocardiography is the cornerstone of PE diagnosis. TTE has limitations for the early diagnosis of PE because it detects vegetations produced by SP in only 50% of cases, valve perforation in 20%, and paravalvular abscesses in 13%. In contrast, TEE plays a key diagnostic role given its greater sensitivity and specificity for the detection of valvular vegetations and other possible complications. Therefore, TEE should be performed in all affected patients. Besides its usefulness for early diagnosis, TEE may improve the prognosis and help to guide medical and surgical treatment [1, 4, 10].

The treatment of PE includes a prolonged course of intravenous antibiotics and, if necessary, surgery. SP resistance to penicillin has increased worldwide during the last decade [2]. Early surgery, on initial hospitalization before completing a full therapeutic course of antibiotics should be performed in patients with symptoms of heart failure due to valve dysfunction. In addition, early surgery is required for patients with complications such as large

vegetations, paravalvular abscesses, or valve perforation, patients with evidence of persistent bacteremia or fever lasting longer than 5 to 7 days after initiating appropriate antimicrobial therapy, or in patients with prosthetic valve endocarditis and relapsing infection. Complete removal of pacemaker or defibrillator systems, including all leads and the generator, is indicated as part of the early management plan in patients with infection of the device or leads. The current debate regarding surgical indications centers not so much around whether surgery should be performed as much as the optimal timing of the intervention. Early surgery is likely to improve the patient's prognosis [1, 11, 12]. The utility of medical treatment alone has only been shown in cases with adequate response to antibiotic treatment, the absence of penicillin-resistant SP, and none of the above-mentioned complications [1, 5, 9].

If strains susceptible to penicillin ($MIC \leq 0.06$ mg/L) are isolated, antibiotic treatment is similar to that used for oral streptococci, except for the use of 2-weeks therapy, which has not been formally investigated. The same applies to strains of intermediate sensitivity to penicillin ($MIC 0.125$ – 2 mg/L) or penicillin-resistant strains ($MIC \geq 4$ mg/L) without meningitis. If the strains are resistant, some authors recommend high doses of cephalosporins (e.g., cefotaxime or ceftriaxone) or vancomycin. The latter must also be used in cases of meningitis, with cephalosporins alone or associated with vancomycin, avoiding penicillin because of its poor penetration of the cerebrospinal fluid [13].

In summary, this report describes the first case in the literature of PE with a periannular abscess on the prosthetic aortic valve, severe aortic paravalvular regurgitation, and a vegetation attached to both the tricuspid septal leaflet and the pacemaker lead. A literature search revealed no such case reports.

TTE has diagnostic limitations for the diagnosis of PE, so TEE should be performed in all cases. TEE favors early detection of the disease and its complications and guides the appropriate therapeutic action throughout the clinical course. Given what has been reported to date [1, 9], and the evolution of our patient, we would emphasize the need for intensive medical treatment and early surgery in patients with complications such as abscesses, large vegetations, or valve perforation, even when the SP is penicillin sensitive.

Consent

Written informed consent was obtained from the patient for publication of this case report and any accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal.

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Conflict of Interest

None declared.

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Supporting Information

Additional Supporting Information may be found in the online version of this article:

Movie S1. Movie clip shows a periannular abscess on the prosthetic aortic valve.

Movie S2. Movie clip shows paravalvular dehiscence with severe paravalvular regurgitation.

Movie S3. Movie clip shows a vegetation attached to both the tricuspid septal leaflet and the pacemaker lead.